Protein micropatterning as a tool to decipher plasma membrane organization and protein interactions

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Abstract

Microstructured surfaces in combination with fluorescence microscopy provide a unique and versatile platform to study protein-protein and protein-lipid interactions in live cells. We have recently developed a protein micropatterning assay based on micro-contact printing that allows not only to monitor protein interactions in living cells but also to extract quantitative information with potential high throughput capabilities [1, 2]. Cells are plated on microstructured surfaces partly covered with ligands (antibodies) targeted against membrane proteins (bait), and the co-localization with a fluorescently labeled protein or lipid of interest (prey) is monitored. This assay has been successfully employed to characterize the interaction between Lck and CD4, two proteins involved in early T cell signaling [1, 2], two glycosylphosphatidyl-anchored proteins [3] and the modulation of the EGFR-Grb2 interaction by EGFR inhibitors [4].
We recently used a combination of micropatterning and single-molecule microscopy techniques to elucidate the nanoscopic arrangement and dynamics of the plasma membrane [5]. Further, we have developed new materials that meet the requirements for printing features in the 100 nm regime and have optimized localization-based super resolution microscopy techniques such as dSTORM and PALM in combination with atomic force microscopy to allow for the characterization of the created patterns.

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